Unified Analysis Workshop

presented by
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UAW 2017 Participants

GGOS

D. Angermann
A. Craddock
R. Gross
G. Stangl

IERS

Z. Altamimi
S. Bergstrand
C. Bizouard
M. Blossfeld
J.-P. Boy
K. Chanard
T. M. Chin
D. McCarthy (remotely)
L. Métivier
N. Stamatakos
D. Thaller

IGS

R. Dach
Z. Deng
T. Herring
G. Johnston
M. Moore
M. Otten
P. Rebischung
P. Ries
A. Sibois
T. Springer
A. Villiger

IDS

H. Capdeville
A. Couhert
F. Lemoine
F. Mercier
G. Moreaux
L. Soudarin
P. Willis

IVS

J. Gipson
R. Heinkelmann
H. Krásná
D. MacMillan
A. Nothnagel
M. Xu

ILRS

C. Luceri
E. Pavlis
J. Ries

IGFS

Total: 42

Sessions

- Opening Session
  - Welcome
- GNSS Systematic Errors and Biases
- VLBI Systematic Errors and Biases
- SLR Systematic Errors and Biases
- DORIS Systematic Errors and Biases
- Site Survey and Co-location
- Reference Systems and Frames
- Conventional Mean Pole
- Standards, Conventions, and Formats
- Interoperability of Portals and Metadata
- Closing Session
  - Summary and discussion of recommendations

GNSS Systematic Errors & Biases

- Recommendations
  - Improve the force and background models
    - Modern static and time variable gravity models
    - Improved diurnal and semi-diurnal EOP models
    - Improved solar radiation pressure models
  - Improve calibrations of GNSS antennae
    - Particularly *in situ* site-dependent calibrations
  - Investigate use of arcs longer than 24 hours
    - In order to study origin of draconitic signals

VLBI Systematic Errors & Biases

- Recommendations
  - Improve the force and background models
    - Improved diurnal and semi-diurnal EOP models
  - Implement the new mean pole model in data reduction s/w
  - Account for gravitational deformation of VLBI antennae
    - When reducing VLBI observations
  - Investigate impact of source structure variability
  - Provide information about the non-tidal atmospheric loading signal removed during data reduction procedures
    - So it can be restored if needed
  - Investigate differences in the different formulations of relativistic effects

SLR Systematic Errors & Biases

- Recommendations
  - Include time and range biases in SINEX file
    - So time biases can be investigated
  - ILRS provide network-fixed products
    - In addition to the loosely constrained products already being provided
  - ILRS establish a Pilot Project to study impact of applying non-tidal atmospheric loading when reducing SLR observations
  - Continue the quality control process
    - To provide feedback to station operators and analysis centers
  - Continue to develop complete and accurate metadata

DORIS Systematic Errors & Biases

- Recommendations
  - Improve the force and background models
    - Modern static and time variable gravity models
    - Improved diurnal and semi-diurnal EOP models
    - Improved solar radiation pressure models
  - Use time transfer by laser link (T2L2) data
    - To better understand behavior of ultra-stable oscillators
  - Continue to investigate the DORIS scale
    - By examining impact of low-elevation data on scale

Site Survey and Co-location

- Recommendations
  - Improve calibrations of GNSS antennae
    - Particularly *in situ* site-dependent calibrations
  - Survey co-location sites that have not yet been surveyed
  - Develop optimized strategy
    - To employ different surveying techniques at the same site
  - Examine discrepancies
    - Between local site surveys and results of space-geodetic analyses

Reference Systems and Frames

- Recommendations
  - The 3 ITRS Combination Centers (CCs) explore the possibility of updating their frames between determinations
    - The Services will need to provide the CCs with the information they need to do this
  - The IERS identify
    - Reference frame users who will benefit from frames represented as time series
    - How time series frames will satisfy their needs
  - The IERS provide up-to-date locations of discontinuities in the coordinate time series
    - For all 4 techniques

Conventional Mean Pole

- Recommendations
  - Update IERS Conventions section on pole tide
    - Replace the filtered mean pole with a linear mean pole

      $\langle X_p \rangle = 55.0 + 1.677 \times t$

      $\langle Y_p \rangle = 320.5 + 3.460 \times t$

      where t is in years past 2000.0
  - Encourage all analysis groups, including altimetry community, to adopt the recommended linear mean pole model
    - For pole tide computations
  - IERS continue to provide a filtered mean pole table
    - For the purpose of modeling and comparing long-term trend in C_{21} and S_{21}
    - The filtering procedure should be clearly defined
    - The spectral response of the filter needs to be made clear

Standards, Conventions, & Formats

- Recommendations
  - SINEX Working Group
    - Examine possibility of extending station codes from 4 to 9 or more characters
  - A unique format for EOP data files be derived
  - A formal process to evaluate new models be developed
    - Before they are adopted by the IERS Conventions
  - Updates to IERS Conventions be citable
  - Continue efforts to ensure that all techniques use consistent gravity models
    - Both static and time variable
  - Endorses recommendations given in the GGOS BPS Inventory
    - That numerical standards be clearly documented
    - That the W_0 value given in IAG Resolution No. 1 (2015) be used as the new reference value for geodetic work: $W_0 = 62\,636\,853.4\ \mathrm{m^2 s^{-2}}$
    - That the development of a new Geodetic Reference System (GRS20XX) based on best estimates of the major parameters is desired

Interoperability of Portals & Metadata

- Recommendations
  - IAG Services develop web portals that are interoperable
    - With each other
    - With the GGOS portal that is being developed

Outcomes (To Date)

- A new linear mean pole model is available

  $\langle X_p \rangle = 55.0 + 1.677 \times t$

  $\langle Y_p \rangle = 320.5 + 3.460 \times t$

  where t is in years past 2000.0

- Differences in different formulations of relativistic effects are understood
  - Due to use of isotropic coordinates rather than conventional (IAU recommended) harmonic coordinates
- Working Group established
  - On subdaily EOP variations
    - To test diurnal and semi-diurnal EOP tide models
    - Recommend a new model to the IERS
    - Chaired by John Gipson of NASA/GSFC
- A more detailed report of the UAW is available from ggos.org:

http://176.28.21.212/media/filer_public/71/81/718149fd-b295-43dd-b82e-d01cacc8363e/uaw2017_report_v4.pdf